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Thursday, July 06, 2006

Prion evolution

Prions are alternatively folded proteins that catalyze the same alternative foldings in other (usually otherwise identical) proteins. Like DNA, prions can be replicators that undergo Darwinian selection:

> ...although the prion "option" [analogous to a gene with two alleles] is clearly subject to conventional Darwinian evolution, in the case of [the prion's] natural selection [the prion] is acting on a non-mendelian, non-genetically encoded trait.

Prions are a protein analog of disappearing polymorphs in crystals. With two "options" the prion as replicator only contains one bit of information, but that's enough to make a difference.

One of the most interesting questions raised is when prions will act more like genes (and thus be largely beneficial to the organism) and when will they act more like harmful diseases. Prion diseases include Creutzfeld-Jacob and "mad cow" disease. According to the replicator/vehicle theory described by Richard Dawkins, if the prion passes through a similar reproductive route as a gene it will tend to be selected like a gene and thus evolve to behave more like a gene (in terms of whether its effect on the organism is helpful or harmful, not in terms of its mechanics, where a prion is very unlike a gene). But if the prion passes from one organism to another through some other route (as in the cannibalism route of mad cow disease and kuru) it will be selected more like a disease and thus behave more like a disease.

Posted by Nick Szabo at 10:20 AM

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About Me

Nick Szabo

"A premier thinker about history, law and economics, and the lessons they have for security." -- Adam Shostack, Emergent Chaos

"Szabo comes out with these essays that leave me in awe." -- Brian Dunbar

"Reading material that is eclectic, challenging and endlessly fascinating." -- Sean McGrath, Propylon

"Like most blogs worth my attention, this blog is updated only infrequently. That is because the authors of blogs worth my attention only post when they have something to say that is true, relevant and not already known by their audience. Most of the human race does not have the skill to know when an idea has these three properties. The skill is particularly rare in the fields of politics and economics, which is why this blog is such a rare and valuable thing." -- Richard Hollerith

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